

ENGINEERING APPENDIX

INTRODUCTION

Proposed projects will be analyzed using the “9101” process. This process will be conducted according to the BLM Manual 9101 procedures and guidelines. BLM Manuals 9101.1, 9101.11, and 9101.12, “Facility Planning” require a feasibility analysis conducted in the field by an interdisciplinary team of resource specialists. Team specialists include those with backgrounds in engineering, soil science, hydrology, wildlife, paleontology, archeology, and range conservation. Resource specialists that initiate projects are responsible for the 9101 team members participation.

STRUCTURAL PROJECTS

Spring Developments

Spring developments consist of capturing high water table seeps. These areas are generally located in drainage bottoms and are evident by plant species and ponded or draining water. The spring is developed by installing a collection system. The collection system can be a plastic barrier with geotextile fabric, gravel drain, or a corrugated metal pipe. All these collection systems are then attached to a buried polyvinyl chloride (PVC) pipeline. The pipeline route leaves the drainage and delivers the water to a stock tank which is located out of the drainage bottom. Sufficient water would be left at the original spring to ensure that riparian vegetation would be protected. Overflow water from the trough would be piped back to the original drainage. The spring would be fenced for the protection of soil and vegetation. Each spring development would disturb about 1/2 acre. When possible the stock tank will be located at least 400 yards out of the drainage bottom.

Water Troughs and Tanks

Troughs and tanks are an integral part of proposed water systems. They vary in size and are usually placed by the operator. Troughs would include a ramp so small birds and mammals could escape. Construction would disturb approximately 0.2 acre per trough.

Wells

Well construction consists of drilling and casing a hole into the aquifer. Wells are cased and developed only when the minimum number of gallons per minute needed are obtained. Casing is then installed and gravel packed to ensure the well's longevity and quality. A bentonite slurry is

pumped from the top of the gravel pack to the ground level to prevent contamination of the producing aquifer. Pipelines and pumping facilities or windmills are placed to deliver the water. Pump facilities for wells may include a gas engine and pumpjack, or an electric submersible pump, or solar-powered pump. Pumping can be controlled by a time switch or pressure tank. Pump houses contain a pressure tank, valves and an electric control box. Wells can deliver water to a single water trough or to several depending on the number of gallons per minute the well yields. Generally windmills deliver water to a single stock tank but can be used to supply water to a storage tank which supplies water to a pipeline.

Reservoirs

Retention reservoirs are placed on drainages. Site selection is dependent on locating an acceptable spillway since this is generally the weak link in reservoir construction. Good spillways are natural, shallow to flat sloped and vegetated. They must be designed to ensure flood routing of a minimum 25 year frequency storm (assuming the reservoir is full). Construction for the embankment consists of moving soils to create a dam across the drainage. Usually soils are removed from the reservoir's storage area which increases its life and holding capacity.

Pit type reservoirs are constructed on shallow drainages, basins, or dry lake beds. Construction consists of digging or blasting a pit to a predetermined size, depending on surface water availability. Small embankments (from soils removed from the pit) are usually placed below the pit to increase its storage capacity. At least 15 to 20 acres of drainage is required to ensure an adequate amount of available water.

Ideally, reservoirs should be large enough and deep enough to hold water throughout the year. Surface area varies from 1 acre (which would disturb a total of about 1 1/2 acres) to 5 acres (which would disturb a total of 7 acres). Reclamation to these areas takes from 2 to 4 years depending on the following year's precipitation. The average reservoir would contain approximately 20 acre-feet of water, with a depth of 18 to 20 feet when full.

Topography and other conditions may present the opportunity to create reservoirs capable of supporting a stocked fishery (generally more than 5 surface acres and 15 to 20 feet deep or more). These reservoirs could require fencing, with water either piped to a trough, or a water gap installed in the fence for livestock use. Whenever feasible an island for waterfowl is designed into the reservoir.

Pipelines

Pipelines carry water from wells to areas that lack an adequate water supply. Generally, a 1 1/2 to 2 inch polyvinyl chloride pipe is buried 6 feet deep. Pipelines must be designed to handle various types of pressure. Common items in pipeline construction are: air-vac valves, pressure reducers, flow restrictors, check and curb stop valves, and hydrants. Water troughs are installed along the pipeline where needed. Approximately 1 acre per mile is disturbed during construction. Reclamation of disturbed areas takes about 2 to 3 years.

Fences

Fencing facilitates implementation of grazing systems and protects riparian habitat. Where big game habitat occurs, fences will be constructed according to BLM specifications (BLM Manual H-1741-1). Approximately 1 acre per mile is disturbed by fence construction.

Cattle Guards

Where traffic warrants, cattle guards are located where fences cross roads. Cattle guards are 8 feet wide and 12 to 24 feet long, depending on traffic type and pattern.

LAND TREATMENTS

Vegetation manipulation is accomplished by various methods such as spraying, burning, and plowing. Treatment methods are determined by vegetation composition and age class, soil surface characteristics, terrain, slope, precipitation, conflicts with other resources, cost effectiveness, and legal constraints. Water spreaders (small dikes constructed with the terrain contour to enhance water spreading over the entire area) are utilized to enlarge water placement and plant utilization. Approximately 1 acre per mile is disturbed by spreader dikes.

After treatment, a rangeland drill or aircraft is used to seed the area artificially with forage species adapted to local conditions. The area is then rested for two growing seasons.

Spraying

Chemical control of noxious weeds consists of spraying the plants with herbicide from an airplane or by ground application. Spraying decreases competition while preserving existing grasses, but it also affects forbs and desirable shrubs.

Burning

Prescribed burning is the carefully planned use of fire for vegetation management. Burning is an inexpensive treatment method and is widely applicable. However, burning requires sufficient fuel and can be used only during ideal conditions; that is, when temperature, humidity, wind, and other factors are right. If fuels are sparse or patchy, burning can leave some areas untreated. With careful planning and application, habitat can be modified or improved.

Plowing

Plowing consists of pulling a heavy-duty multiple-disk plow through the soil, disturbing 90 to 95 percent of the shrub cover and the majority of desirable grasses and forbs. Plowing is expensive, causes ground disturbance, and cannot be used in rough, rocky areas.

In-stream Structures

In-stream structures are primarily gabions or check dams of rocks or logs placed in streams and ephemeral water sources to slow water flow and diminish erosion. Structures placed in flowing streams are designed to form splash pools below the dams or gabions to improve fish habitat.

RECREATION DEVELOPMENTS

Recreation sites are generally small developments. They consist of installing small picnic areas with tables, fire rings and grills, and in some cases toilet facilities. Hiking, riding trails, and boat ramps may be developed in areas having potential for this type of development.

ROADS

Road development is limited to areas where there is a demand for it. Development would include cut and fill, ditch and shoulder work, realignment of existing roads, and in some cases hauling in gravel. To date, no new roads have been constructed for the purpose of access as BLM usually gains easements on existing roads. Some roads have been improved by contract work or by BLM equipment operators. The potential for road development exists for access into large BLM tracts or larger new recreation sites. The BLM Division of Operations maintains the existing transportation system in the Miles City Office. The transportation system or plan (USDI, BLM 1987e) shows all BLM roads whether maintained annually or periodically.